

How Wall Street Investors Rescued the Market for Single Family Homes*

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Abstract

We examine the impact of house purchases by large buy-to-rent investors on the value of nearby properties. Returns on repeat sales of properties within a quarter mile of houses purchased by buy-to-rent investors were significantly greater if the repeat sale concluded after the buy-to-rent purchase rather than before. Properties outside the price range normally paid by buy-to-rent investors experienced smaller gains after nearby buy-to-rent purchases. Mortgage use increased after the buy-to-rent purchases for nearby properties. Buy-to-rent investors appear to increase the value of homes in an area by providing liquidity and reducing the local supply of houses.

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*Data provided by Zillow through the Zillow Transaction and Assessment Dataset (ZTRAX). More information on accessing the data can be found at <http://www.zillow.com/ztrax>. The results and opinions are those of the authors and do not reflect the position of Zillow Group.

Introduction

In many parts of the country, real estate prices increased steadily over 2000 – 2006, declined sharply from 2006 – 2009, and continued to fall into 2011. A number of authors have claimed that prices were irrationally high in 2005 – 2006. Less appreciated is that in 2010 – 2012, some value investors believed that single-family home prices in some cities presented a historic buying opportunity. Warren Buffett, on February, 27, 2012 on the CNBC show Squawkbox, said he would like to buy “a couple hundred thousand” single-family homes if it were practical to do so.

A new business model, the large scale buy-to-rent investor, emerged to take advantage of the perceived mispricing of single family residences. These investors each bought thousands of homes in targeted cities, renovated and repaired them, and rented them out. In this paper, we use over 100,000 single family home purchases by eight large buy-to-rent investors in seven states to test whether the buy-to-rent investors were correct in their belief that house prices were too low. A challenge in answering this question is that buy-to-rent investors have sold very few of the houses that they acquired over 2010 – 2014. So, as a proxy, we examine returns to properties within a quarter mile of the buy-to-rent purchase. Using repeat sales of individual houses, we show that after adjusting for purchase year, the difference between returns for nearby houses sold after the buy-to-rent purchase and nearby houses sold before the buy-to-rent purchase were much larger than difference in returns of more distant properties. The additional returns of nearby properties is estimated to be over 7% in the first year after the buy-to-rent purchase and over 5% in the second year.

Buy-to-rent investors appear to have been spectacularly right in their assessment that single family homes in some areas were great investments in 2011 - 2012. That house prices were too low and that smart investors could recognize this is plausible when one considers the market frictions that prevented individuals from buying cheap houses. Many homeowners had lost all of their equity in previous house purchases and lacked money for a down payment. Hundreds of thousands of homeowners had defaulted on mortgages or declared bankruptcy and were unable to borrow to buy a new house. As we will show, in states that suffered severe house price declines, the proportion of houses bought with mortgages was much lower in 2011 – 2013 than in 2003 – 2008. Traditional buyers of houses were forced to the sidelines in 2011 – 2013.

The buy-to-rent investors who did buy houses in 2011 – 2013 were the pioneers in institutional investing in single family homes. Institutions that invested in real estate had traditionally bought commercial

property or apartment buildings. Individual houses are more difficult for an institutional investor to manage because they are all unique and they are geographically dispersed. Investment in houses as rental properties had been the province of individuals or small partnerships. There were some technological changes, like mobile computing and mobile internet connectivity that made it easier for an institutional investor to manage a portfolio of single family homes. The big impetus for institutional entry into the single family home market was, however, the opportunity to acquire large numbers of geographically concentrated houses at very low prices.

Our evidence suggests that buy-to-rent investors correctly identified undervalued property and that is why nearby houses, and presumably their purchases as well, appreciated significantly after the buy-to-rent purchases. It is possible that part of the appreciation of nearby properties comes from elimination of negative externalities by buy-to-rent purchases. A large proportion of the house bought by buy-to-rent investors were foreclosed properties. Prior to their purchase, these properties may have been vacant and poorly maintained and may have attracted crime and vandalism. We find, however, that returns to nearby properties are almost as large when a buy-to-rent investor buys a property that was not foreclosed as when it purchases a foreclosed house.

Some observers have expressed concern that purchases by buy-to-rent investors could impose negative externalities on nearby homeowners. In general, renters are considered less desirable neighbors than homeowners. Renters are less concerned about property values and upkeep. They may be less involved in community affairs and local schools than homeowners if they believe they are short-term residents. We find no evidence that buy-to-rent purchases are harmful to nearby homeowners. Prices of nearby homes increase after buy-to-rent investors acquire houses. In addition, access to mortgages appears to increase. After purchases by buy-to-rent investors, the proportion of nearby homes purchased with mortgages increased significantly, while mortgage use to buy distant properties did not change. This suggests that following buy-to-rent purchases, homebuyers who had been sidelined started to trickle back into the market.

Institutional investors and the housing market following the crisis

Over 2006 – 2012, house prices fell sharply in many parts of the country. In some cities, houses sold for well below replacement cost. Many homeowners chose to default on mortgages that far exceeded the value of their houses. In June 2012, there were 1.8 million house foreclosures and another 1.3 million homeowners were at least 90 days behind on mortgage payments. Despite low prices and a large supply

of available properties, many individuals were unable to buy houses. In some cases, the individuals were left with no equity for down payments after losing money on previous house purchases. In other cases, potential buyers' credit ratings were ruined after defaulting on mortgage payments. In addition, mortgage lenders reduced lending and tightened lending standards. Individuals and families who would normally buy homes rented instead. Overall, homeownership fell from 69% in 2006 to 65% in 2013. Edelman (2014) notes that in early 2013, 43 million American households rented housing, as compared to 36.7 million before the crisis. Schnure (2014) observes that the number of families renting single family homes increased from 11.34 million in 2007 to 13.18 million in 2011. The decline was not evenly distributed across the country. Over 2007-2010, single family rental homes increased 48% in Phoenix, 41% in Atlanta, and 36% in Chicago.

The decline in homeownership after the crisis was accompanied by home purchases by investors. Allen et al (2018) examine 72,128 single-family home transactions in Miami-Dade County, Florida, between January, 2009 and September, 2013. Investors are the buyers in 34.1% of transactions. Investors in single family homes have traditionally been individuals or partnerships based near the rental properties. Following the crisis, however, institutional buyers began purchasing single family houses as rental properties. Khater (2013) notes that many cities saw sharp declines in real estate inventories in 2012 due to institutional buying activity. Cities that had rapidly increasing institutional buying included Atlanta, Detroit, Las Vegas, Phoenix, Los Angeles, Riverside, and Sacramento. Mills, Molloy, and Zarutskie (2017) propose three explanations for why large institutional investors entered the market for single-family homes after the financial crisis. First, the large inventory of homes made it easier for buy-to-rent investors to create geographically concentrated pools of similar homes. Second, tight mortgage financing gave large firms an advantage in competing for houses and spurred demand for rental units. Finally, technological developments like the widespread use of mobile devices and mobile internet connectivity made scattered-site property renovation, maintenance and management more efficient.

Institutional investors typically acquire property at low prices. Smith and Liu (2018) examine the prices paid by institutional investors for houses in Atlanta over 2000 – 2014. They find, that after adjusting for house characteristics, cash purchase and distressed sale discounts, institutional investors purchased houses at significant discounts of 6.3% to 11.8% relative to owner-occupiers. Similarly, Allen et al (2018) show that investors in single-family homes in Miami-Dade County, Florida purchase at a discount to single-purchase buyers. Discounts are larger for large investors (6 to 28 properties) and medium investors (3 to 5 properties) than institutional investors. Part of the reason for the low purchase prices paid by investors is

that they are more likely to pay cash than other investors. Even after adjusting for cash payments however, investors pay less than single purchase buyers.

Ganduri, Xiao, and Xiao (2019) study the purchase by institutional investors of 1,763 single family homes in three bulk sales under the FHFA's bulk sale initiative. Buyers were required to bid on the entire portfolio of houses and so could not choose to buy in locations that they felt were most promising. This makes their choice of any specific property independent of their expectations for local price appreciation. Ganduri, Xiao, and Xiao find that prices of nearby properties increase following the purchases, which suggests that institutional investments provide positive externalities.

Many of the houses purchased by institutional investors during this time were foreclosed. Foreclosed properties in a neighborhood may lead to crime or vandalism. They may be poorly maintained and unsightly eyesores. Gerardi et al. (2015) study the impact of foreclosures on nearby properties using 950,234 repeat sale pairs from 15 MSAs. They find that an increase of one house in serious delinquency within 0.1 miles decreases house prices about 1.2%. An increase in one house owned by a bank decreases property values about 1%.

Foreclosures resulted in a glut of properties in many markets. Many homebuyers were unable to get mortgages and shut out of the market. Buy-to-rent investors provided liquidity and reduced the excess supply of houses. Anenberg and Kung (2014) examine the impact of foreclosures on prices of nearby homes in Chicago, Phoenix, San Francisco, and Washington DC over 2007-2009 and consider two possible channels for a spillover effect. The first is the negative externalities that vacant houses provide through crime, vandalism, etc. The second, or competitive affect is the effect on house prices of increasing the number of other houses on the market. As a whole, Anenberg and Kung (2014) favor the supply explanation for the house price decline.

The limited evidence available to date suggests that house purchases specifically by large buy-to-rent investors increases nearby house prices. Allen et al (2018) estimate that a 10% increase in purchases by investors (e.g. 40% to 50%) in a census tract increases house prices there by 0.20%.

Data

Our source of data on real estate transactions is Zillow, which in turn obtains them from county deeds. Our data has all real estate transactions in most U.S. counties over 2000 – 2015. For each transaction, we

have the date of the sale, the identity of the buyer and seller, the price paid for the property, the state, county, city and street address of the property, and the property's latitude and longitude. We have mortgage information including whether the mortgage is a fixed rate mortgage or an ARM, the amount borrowed, term of the mortgage, and the identity of the lender. In most cases, we also have annual assessed values of the properties.

We restrict our study to seven states: Arizona, California, Florida, Georgia, Illinois, Nevada, and North Carolina. Each of these states is mentioned in prospectuses of large buy-to-rent investors and in articles on the investors that appeared in the popular press. All of these states saw significant activity by buy-to-rent investors over 2010-2015. The “sand states” of Arizona, California, Florida and Nevada experienced especially large run-ups in house prices over 2000 – 2006, and very sharp downturns in house prices afterwards.

Housing markets before and after the financial crisis

There is some variation from city to city in the timing of the housing price peaks, but in general, prices peaked around late 2006 all over the country. Figure 1 shows monthly median home values by state from Zillow. In each of the states in our sample, prices peaked in 2006 and reached minimum levels in 2012. North Carolina was a state that experienced a modest decline in home prices over this time, with median values falling from about \$155,000 to about \$135,000. For the sand states, Arizona, California, Florida and Nevada, the decline was much steeper. From 2006 to 2012, median prices fell about 50% in Florida and Arizona. In California prices declined a little less, in Nevada a bit more.

Part of the decline in house prices may be due to buyers having difficulty obtaining a mortgage. Following the financial crisis, some lenders conserved capital to build reserves and others adopted more stringent lending standards. Some potential homebuyers had damaged credit ratings following defaults on previous mortgages. Others had little equity for a down payment after losing money on previous house purchases.

Figure 2 shows the monthly proportion of homes purchased with mortgages in each state over 2003 – 2015. In each state, the proportion of houses purchased with mortgages is highest before 2007. In Illinois and North Carolina, the proportion of houses bought with mortgages declines more or less smoothly over 2007-2015. In the other states, the proportion of houses bought with mortgages declined sharply after 2007. In Nevada, about 80% of homes were purchased with mortgages over 2003-2005. In 2008-2009, it

was about 35%. In California, about 80% of houses were bought with mortgages over 2003-2005, but less than 50% over 2008-2009.

Institutional Investors

We focus on the impact of house purchases by eight major buy-to-rent investors: Altisource, American Homes 4 Rent, American Residential Properties, Colony American Homes, Invitation Homes, Progress Residential, Silver Bay Realty Trust and Starwood Waypoint Realty Trust. These investors are among the largest if not the largest buy-to-rent investors and account for a large proportion of the total institutional investment in single-family homes. Purchases by these investors were concentrated in a few states. We examine purchases in the states of Arizona, California, Florida, Georgia, Illinois, North Carolina, and Nevada. These investors purchased additional houses in other states, including Tennessee, Indiana, and Ohio, but the bulk of their purchases were in the seven states that we examine.

Prospectuses and company press releases suggest that all of these buy-to-rent investors have a similar business model. They are organized as real estate investment trusts (REITs)¹. Most of their houses are purchased for cash at foreclosure auctions at a discount to prices of houses that are not in foreclosure. They are unable to conduct interior inspections before purchase, and rely on computer models to determine which houses to buy and how much to pay. They typically spend \$20,000 to \$25,000 to renovate properties before renting them out. They attempt to take advantage of economies of scale by purchasing large numbers of houses in a metropolitan area. Buy-to-rent investors prefer to rent to middle class families. Their preferred purchase is a three-bedroom, two-bathroom house in a good school district. All of these buy-to-rent investors entered real estate markets in the same cities at about the same time. Single family homes appeared to be a very good investment to many value investors.

Panel A of Table 1 reports the number of house purchases that we identify in the Zillow data for each of these investors in each state. In total, they purchased over 100,000 homes. The largest number, 39,770 were in Florida. Invitation Homes, a subsidiary of Blackstone, was the most active buyer with 29,384 house purchases. There is some specialization by investors in different states. For example, almost half of American Residential Properties purchases are in Arizona. For the most part though, investors spread their purchases across all seven states.

¹ Most of Invitation Homes is owned by The Blackstone Group.

Panel B of Table 1 presents the proportion of houses bought by buy-to-rent investors that had been foreclosed and the proportion that were foreclosed and bought in auctions. Auctioned properties are generally foreclosed houses, but not all foreclosed houses are bought at auction. About 24% of the properties of Invitation Homes, the largest purchaser of houses, were in foreclosure when bought. American Homes 4 Rent, the second largest purchaser, acquired 32.5% of their properties from foreclosures. Foreclosed houses are a large proportion of purchases in all states, but are largest in Georgia (47.4%) and California (35.0%). Foreclosed houses were 47.5% of purchases in 2012. The proportion declined each year from 2013 – 2015 as fewer foreclosures took place. With the exception of Arizona, where the ratio is 0.2757 for zip codes without buy-to-rent purchases and 0.3862 for zip codes with buy-to-rent investors, individual state results confirm that buy-to-rent investors were active in the zip codes that had experienced sharp declines in house sales. In Illinois, house sales declined 10% in zip codes that buy-to-rent investors avoided, and over 62% in zip codes where they were active. In Nevada, house sales actually increased by over 80% in zip codes without buy-to-rent purchases but declined by 65% in areas where they were active.

Figure 3 depicts the number of purchases by all of the Wall Street investors combined by month for four counties with a large number of purchases: Maricopa County, Arizona (Phoenix), Clark County, Nevada (Las Vegas), Broward County Florida, and Los Angeles County, California. In each case, the number of purchases was particularly large during the second half of 2013. In the case of Los Angeles County, purchases were high in 2012, and for Broward County, Florida and Clark County, Nevada, heavy buying continued well into 2014. For the most part though, investor activity is roughly synchronous across locations.

Results

Profits to Institutional Purchasers and Prices of Nearby Houses

We identify bundles of purchases by institutional buyers in the following way. Starting with all institutional purchases in a state within a calendar quarter, we identify the pair of homes that were located closest to one another. Distances are straight-line distances calculated from the properties' latitude and longitude. If the pair were within $\frac{1}{2}$ mile of each other, we identify them as a bundle. We define the center of the bundle as the average latitude and longitude of the houses in the bundle. With two houses, this means that each is within $\frac{1}{4}$ mile of the bundle center. We then go through the set of all institutional purchases a second time and pick out the next closest pair of houses. If the pair is within $\frac{1}{2}$ mile of each

other this is a second bundle. If instead, the closest pair is a new house and the center of the previous bundle, the new house is added to the bundle, and the new center is the average of the latitudes and longitudes of the three houses that make up the bundle. We continue this process until all other houses purchased by institutional buyers are more than ½ mile from existing bundles or other institutional house purchases. Houses that are more than ½ mile from any others are treated as bundles by themselves. Bundles are small. About 79% are one house, and about 94% are one or two houses. A number, however, include over 10 houses. We do not require that all houses in a bundle be purchased by the same buy-to-rent investor.

We then find all repeat sales of houses within ¼ of a mile of the center of each bundle in which the second sale took place in the quarter just before or within four quarters after the quarter of the institutional purchases. As a control, we also find all repeat sales of houses in the same state between 50 and 75 miles away from the center of the bundle in which the second transaction of the repeat sale occurred in the quarter before or the four quarters after the buy-to-rent purchase. These properties are also at least 50 miles from the center of any other bundle. Using all repeat sales, we estimate the following regression

$$\ln\left(\frac{P_2}{P_1}\right) = \gamma_{Bundle,BuyYear} + \alpha_1 D_{<\frac{1}{4}Mile} + \alpha_2 D_{AfterInst.Buy} + \alpha_3 D_{<\frac{1}{4}Mile} \times D_{AfterInst.Buy} + \varepsilon_i \quad (1)$$

Where P_2 is the price of the house in the second transaction, P_1 is the house price in the first transaction, $\gamma_{Bundle,BuyYear}$ is a fixed effect for the combination of the institutional buy bundle and the purchase year for the first trade in the round trip. $D_{<1/4Mile}$ is a dummy variable that is one if the property is no more than ¼ miles from the center of the bundle, $D_{AfterInst.Buy}$ is a dummy variable that is one if the second transaction in the repeat sale took place in the four quarters following the institutional purchases in the bundle, and zero if the transaction took place in the quarter before the institutional purchases.

Note that with the fixed effects we control for the location of the house and the year of the first transaction in the repeat sale. Hence the coefficient of $D_{AfterInst.Buy}$ reflects the difference in real estate returns of houses that were bought around the same time but sold before and after the institutional purchases, while the coefficient on the product of $D_{<1/4Mile}$ and $D_{AfterInst.Buy}$ is the additional difference in real estate returns for houses that were bought around the same time but sold before and after the institutional purchases and were located near the center of the bundle.

We first estimate (1) using transactions from all seven states. Results are reported in Panel A of Table 2. Regression (1) reports results when we do not cluster standard errors on the repeat sale and include every repeat sale. There are a total of 1,030,838 observations in this regression and 248,829 fixed effects for

bundles of institutional purchases. So, on average, about four sales take place within a year of institutional bundle purchases. The intercept coefficient is 0.041. These regressions are run using Stata. In Stata, when fixed effects are used, the intercept is the average fixed effect. In this case, it indicates that home sellers made $e^{0.041} = 4.2\%$ on their houses if they sold before the institutional purchases. The coefficient on $D_{<1/4\text{Mile}}$ is -0.251. Recall that there are fixed effects for each combination of house purchase year and buy-to-rent purchase bundle, so this coefficient implies that home sellers who had nearby properties and sold in the year before the buy-to-rent purchase lost $e^{-0.251} - 1 = 22.2\%$ more than home sellers who bought houses in the same year 50 to 75 miles away. This is not surprising. Buy-to-rent investors bought into areas with depressed house prices. Our sample consists of house sales that took place in 2010 – 2015, and sellers typically purchased their houses before the collapse of real estate prices in 2007-2009. The coefficient on the dummy variable for after institutional purchases is -0.007 with a t-statistic of -2.1. Prices for houses located 50 to 75 miles from the buy-to-rent bundle decreased in value in the year after the buy-to-rent purchase, but only by a small amount. The coefficient on the interaction between being close to a buy-to-rent bundle and selling after the institution purchased is 0.105 with a t-statistic of 13.4. House prices did increase significantly in the year after buy-to-rent institutional investors bought houses, but only for houses near their purchases.

In the regression reported in the second column, we cluster standard errors on the repeat sales. In doing this, we acknowledge that the same repeat sale, when used with different bundles of institutional purchases in different months, does not provide independent observations. In this regression, we also exclude repeat sales with the largest and smallest 1% of returns. Very large returns could reflect expensive property improvements. Very small returns may occur if the second transaction in a repeat sale is not an arm's length transaction. A house could be sold, for example, to a son or daughter. Very large or small returns could also be due to data errors.

Coefficient estimates for the second regression are very similar to the coefficient estimates in the first regression. Exclusion of outliers has little effect on the estimated impact of institutional purchases on nearby property prices. Clustering of standard errors does reduce t-statistics, but coefficients remain statistically significant, particularly on the dummy variable for being within a ¼ mile of a buy-to-rent bundle, and the interaction between that dummy variable and the dummy for after the buy-to-rent investor purchased property. Again, prices increase after buy-to-rent investors purchase houses, and they increase far more for properties located close to the buy-to-rent purchases. This regression, with outliers discarded and clustering of standard errors on repeat sales, will be the baseline regression for work in the rest of the paper.

By using only one quarter before the buy-to-rent purchase as the before period, we minimize the possibility that some of the price appreciation occurred before the actual buy-to-rent purchase. A disadvantage of using just one quarter as a before period is that there may be few or no nearby round-trip transactions before a buy-to-rent purchase. In regression (3), we use four quarters before the buy-to-rent purchase as the before period. The number of observations more than doubles from the second regression and the t-statistic on the interaction between the round-trip being completed after the buy-to-rent purchase and the property being close to the buy-to-rent purchase increases from 4.0 to 6.0. The coefficient on the interaction increases marginally from 0.073 to 0.096. It doesn't appear the prices of nearby houses increased very much during the year prior to the buy-to-rent purchase.

For the fourth regression, we continue to omit outliers and cluster standard errors on the repeat sale. This time though, we use six months, rather than one year for the after period. Results are basically unchanged, with the coefficient on the interaction between the dummy variable for after institutional purchases and the dummy variable for being within $\frac{1}{4}$ of the buy-to-rent property decreasing from 0.073 to 0.069. This is not a statistically significant difference.

The fifth regression includes only repeat sales of houses that were within $\frac{1}{10}$ of a mile of a bundle of institutional purchases, and that occurred within one quarter before or four quarters after the institutional purchases. This has little impact on the coefficient on the interaction between being close to the buy-to-rent bundle and selling after the bundle is purchased, raising it from 0.073 in the second regression to 0.087. The impact of institutional purchases on houses within $\frac{1}{10}$ of a mile is somewhat larger than the impact on houses within $\frac{1}{4}$ of a mile, but the difference is not statistically significant. Finally, the sixth regression includes only round trips within $\frac{1}{10}$ of a mile of the cluster of institutional purchases in which the last trade took place no later than two quarters after the purchases. The coefficient on the interaction between being close to a buy-to-rent bundle and selling after the buy-to-rent purchase is 0.084.

As a whole, Panel A demonstrates that our results are robust to changes in methodology. Following a purchase by a buy-to-rent investor, prices increase more for nearby houses than for distant houses. That is true whether outliers are included or not, whether nearby is defined as $\frac{1}{10}$ mile or $\frac{1}{4}$ mile, and whether the before and after period is six months or one year.

In the second regression, which we use as a benchmark for the rest of the paper, the coefficient on the dummy variable for after the buy-to-rent purchase is 0.016 and the coefficient on the interaction between

the dummy for after the buy-to-rent purchase and within ¼ mile is 0.073. This indicates that houses near the buy to rent purchase appreciated by $e^{0.016+0.073} = 9.3\%$. This is a good estimate of the appreciation of houses purchased by buy-to-rent investors in the first year after their purchase. It is a measure of their ability to time the real estate market and to determine good locations for purchases. It does not, of course, include any increase in house value from improvements nor does it measure any return from skillfully negotiating low purchased prices.

Panel B provides evidence on the impact of buy-to-rent purchases for each of the individual states. The individual state regressions are the same as the second regression from Panel A. That is, outliers are omitted, standard errors are clustered on the repeat sale, the before period is one quarter, the after period is four quarters, and repeat sales are near to the buy-to-rent bundle if they are within ¼ mile. For Arizona, California, Florida, Nevada and Illinois, results are similar to the results for all states combined. The coefficient on the dummy variable for being close to the buy-to-rent purchase is negative and statistically significant. Before the buy-to-rent investors moved in, prices had fallen more for houses near where they bought than for houses farther away. The interaction between being close to the buy-to-rent purchase and taking place after buy-to-rent investors bought in is positive and statistically significant for California, Florida, Illinois and Nevada. In general, coefficients on the interaction term are larger for the individual states than when all observations are used in one regression. After the buy-to-rent investors purchased, prices of nearby houses increased by more than those of houses farther away.

Results for Georgia and North Carolina are different. Estimates of α_2 coefficients indicate that buy-to-rent investors are not buying into areas that had experienced greater price declines. Prices of houses near the buy-to-rent purchases do not increase more than do distant houses after the buy-to-rent investors purchase homes. Put another way, there was a big decline in prices for houses in the areas where buy-to-rent investors entered the market and a big recovery but only for the states that were hit hard by the collapse of house prices in 2007-2008.

Thus far, we have compared returns to properties within ¼ mile of a buy-to-rent purchase with returns to properties 50-75 miles away. In general, the distant properties are not in the same metropolitan area as the buy-to-rent purchase. It is interesting to see if buy-to-rent investors' properties appreciate relative to houses in the same city, and not just with respect to houses outside the metropolitan area. So, we reestimate regression (1) using properties within ¼ mile of the buy-to-rent purchases, and properties five to ten miles away. Regression estimates are presented in Panel C of Table 2.

The first regression contains 1,242,672 observations from all states. There are 285,047 purchase year-bundle fixed effects, so there are an average of about four and a half repeat sales for each. The intercept is -0.020 and the coefficient on the dummy variable for being close to the bundle of institutional properties is -0.106. Homeowners who were located five to ten miles from the institutional bundles lost a little when they sold houses before the institutional purchase, but homeowners who were located within $\frac{1}{4}$ of a mile experienced significant additional losses if they sold before the buy-to-rent purchase. The coefficient on the dummy variable for the period after the institutional purchase is 0.047, suggesting that homeowners five to ten miles from the buy-to-rent bundle who sold after the buy-to-rent purchase had returns that were about 4.7% greater than homeowners who sold before the institutional purchase. The coefficient on the interaction of the dummy variables for a sale after the buy-to-rent purchase and a location close to the bundle is 0.033. While house prices in the area rose after an institutional purchase, they rose about 3.3% more for houses close to the bundle of purchased properties. Buy-to-rent investors purchased properties in areas that outperformed other parts of the same metropolitan area.

Regressions for individual states are shown in the other columns of Panel C. For five of the states, Arizona, California, Florida, Illinois, and Nevada, the coefficient on the interaction between the dummy for being close to a buy-to-rent bundle and the dummy for after the buy-to-rent purchase is positive and significant. In these states, properties near the buy-to-rent purchases appreciated more than properties five to ten miles away. For Nevada, the coefficient is 0.114 and for Illinois it is 0.072. In these states, properties within a $\frac{1}{4}$ mile of a buy-to-rent purchase appreciated much more than properties five to ten miles away.

An unanswered question is whether all of the buy-to-rent investors were successful in identifying undervalued single-family homes. All eight seem to have similar business models but differences in skill and timing may lead to different results. Hence we rerun the regressions in Panel C for each buy-to-rent investor using only bundles that included at least one purchase by the investor. Nearby properties are again properties within $\frac{1}{4}$ mile of the bundle center while distant properties are five to ten miles away. Regression estimates are shown in Panel D of Table 2.

Results are broadly consistent across buy-to-rent investors. For six of the eight, the coefficient on the dummy for after buy-to-rent purchases is positive. Properties five to ten miles away from the buy-to-rent purchases, as well as properties within $\frac{1}{4}$ mile of the bundles appreciated in the four quarters after the purchases. For seven of the eight, the coefficient on the interaction between being within $\frac{1}{4}$ mile of the buy-to-rent bundle and the transaction occurring after the purchase is positive. The coefficient on this

interaction is positive and statistically significant for five of the eight investors. The buy-to-rent investor with a negative coefficient on the interaction between being close to the buy-to-rent bundle and the transaction occurring after the purchase is Silver Bay Realty trust. There are far few observations for this investor than any of the others, leading to noisy estimates of the coefficients in the regression.

The lesson of Panel D is that a number of investors successfully identified investment opportunities in single-family homes. The fact that so many investors were able to identify these opportunities suggests that significant frictions kept traditional homebuyers from taking advantage of them. Instead, a new business model, the large-scale buy-to-rent investor was required.

A concern may be that buy-to-rent investors propped up prices in the short-run by reducing the stock of houses, but that prices fell later. To examine the long-term impact of buy-to-rent purchases, we estimate the following regression, using round trip transactions completed one quarter before and up to eight quarters after the buy-to-rent purchase.

$$\ln\left(\frac{P_2}{P_1}\right) = \gamma_{Bundle,BuyYear} + \alpha_1 D_{<\frac{1}{4}Mile} + \alpha_2 D_{AfterInsBuy} + \alpha_3 D_{2ndYearAfterBuy} + \alpha_4 D_{<\frac{1}{4}Mile} \times D_{AfterInsBuy} + \alpha_5 D_{2ndYearAfterBuy} \times D_{AfterInsBuy} + \varepsilon_i \quad (2)$$

The dummy variable $D_{AfterInsBuy}$ is set to one if the repeat sale is completed up to eight quarters after the buy-to-rent purchase, while the dummy variable $D_{2ndYearAfterBuy}$ is set to one if the repeat sale was completed five to eight quarters after the buy-to-rent purchase. As before, outliers are discarded and standard errors are clustered on the repeat sale. Panel E of Table 2 presents the regression estimates.

The regression using transactions from all states is presented first. The coefficients on the dummy variables for after the buy-to-rent purchase and the second year after the buy to rent purchase are both positive, but insignificant. Put another way, prices of distant houses appear to have increased after buy-to-rent purchases, but the increase is not statistically significant. The coefficient on the interaction between the dummy variable for being close to a buy-to-rent purchase and the sale taking place after the purchase is 0.073 with a t-statistic of 4.4. This is consistent with results in Panel A. Prices of houses that were close to houses purchased by buy-to-rent investors appreciated by $e^{0.073} = 7.6\%$ more over the year after the buy-to-rent purchase than did properties 50-75 miles away. In addition, the coefficient on the interaction between being close to a buy-to-rent purchase and completing a sale in the second year after a buy-to-rent purchase is 0.057 with a t-statistic of 2.8. Nearby houses continue to appreciate in the second year after a purchase by buy-to-rent investors.

The rest of the columns of Panel E present regression results for individual states. For five states, California, Florida, Illinois, Nevada, and North Carolina, the coefficient on the interaction between being close to a buy-to-rent purchase and transaction in the second year after a buy-to-rent purchase is positive. It is statistically significant in two states, Nevada and North Carolina.

Wall Street investors generally buy houses in price ranges that allow them to profitably rent to middle class tenants. Expensive houses are difficult to rent. Cheap houses require more maintenance and have tenants who are more likely to miss payments. Purchases by Wall Street investors would reduce the supply of houses in the price range in which they buy, but not the supply of either very cheap or very expensive houses. The housing market is not perfectly segmented by price, but nonetheless we would not expect returns of cheap or expensive houses to be affected as much by buy-to-rent purchases as returns of houses in the price range favored by these investors. Examining the appreciation of houses in the price range purchased by buy-to-rent investors may give a more accurate picture of their returns.

For each state, we calculate the distribution of purchase prices paid by Wall Street investors over 2010-2015. Results are shown in Panel A of Table 3. The distribution of prices across all states is shown in the first row. The median price is \$144,184, while the 5th percentile price is \$65,000 and the 95th percentile price is \$305,000. Distributions of prices for each individual state are presented in the following rows. Prices are generally higher in California and lower in Georgia. The range of prices in individual states is usually narrower than the distribution across all states.

For comparison purposes, Panel B provides the distribution of prices in all transactions over 2010 – 2015. For all states together, and for the individual states, the dispersion of prices in all transactions exceeds the dispersion of prices paid by buy-to-rent investors. This confirms that buy-to-rent investors purchase houses in a specific segment of the market, in a price range that appeals to middle-class renters.

To see if returns for properties that are outside of the price range of buy-to-rent investors are affected by buy-to-rent purchases, we run the following regression using repeat sales of properties within ½ mile of the center of a bundle of houses purchased by an investor.

$$\ln\left(\frac{P_2}{P_1}\right) = \gamma_{InstHouse,BuyYear} + \alpha_1 P_{1<5th\ Pct} + \alpha_2 P_{1>95th\ Percentile} + \alpha_3 D_{AfterInst.Buy} + \alpha_4 P_{1<5th\ Pct} \times D_{AfterInstBuy} + P_{1>95th\ Pct} \times D_{AfterInst.Buy} + \varepsilon_i \quad (3)$$

Where $\gamma_{InstHouse,BuyYear}$ is a fixed effect for the buy-to-rent purchase bundle and the purchase year of the repeat sale property, $P_{1<5th\ Pct}$ is a dummy variable if the first price in the repeat sale was less than the 5th

percentile of purchase prices for buy-to-rent investors, $P_{1 > 95^{\text{th}} \text{ Pct}}$ is a dummy variable if the first price in the repeat sale was greater than the 95th percentile of purchase prices for buy-to-rent investors, and $D_{\text{AfterInstBuy}}$ is a dummy variable that is one if the second transaction in the repeat purchase took place after the purchase by the buy-to-rent investor. By using $\frac{1}{2}$ mile rather than $\frac{1}{4}$ mile we are better able to include nearby properties that sold for very different prices than the properties purchased by buy-to-rent investors. We do not include more distant properties. We include only repeat sales in which the second sale occurred within 12 months of the purchase of the cluster of houses. Regression estimates are provided in Table 4.

The first column provides the regression estimate when observations from all states are included. As before, we use fixed effects for each combination of purchase bundle and year of the first transaction in the repeat sale. Standard errors are clustered by the repeat sale. The regression intercept is -0.226, indicating that on average, homeowners who lived within $\frac{1}{2}$ mile of a buy-to-rent bundle and sold in the four quarters before the bundle purchase suffered significant losses. The coefficient on the dummy variable for cheap properties is 0.575, suggesting that these homeowners sold property for significant gains in the year before the bundle purchase. It is possible though, that owners of cheap property spent more on repairs and renovations than other homeowners, and the returns could therefore be exaggerated. The coefficient on the dummy variable for expensive properties is -0.040. Returns on these properties were particularly low if sold before investors purchased the nearby bundle of homes.

Of course, our main concern is the impact of Wall Street investors' purchases on prices of nearby homes. The coefficient on the dummy variable for a second sale that took place after the investor purchase is 0.114. Prices of nearby homes were significantly higher in the year after the purchase of houses by Wall Street investors. The coefficient on the cheap house after the bundle purchase is -0.038, with a t-statistic of -7.2. The coefficient on the interaction between after the institution purchase and an expensive house is -0.017 with a t-statistic of -5.5. Houses outside the price range purchased by Wall Street investors appreciated less after the investor purchases. Externalities from nearby vacant houses should affect the values of all nearby homes, regardless of their value. To the extent that the home market is segmented by price, this is consistent with price appreciation being a result of investors correctly anticipating where or home appreciation would be greatest, or with them removing the excess supply of houses from the market.

Regressions for individual states are shown in the remaining columns. The coefficients on the interaction between cheap houses and after the investor purchase are negative for every state except Georgia, and are

significant at the 5% level for Florida, North Carolina, and Nevada. The coefficients on the interaction between expensive houses and transactions after the Wall Street investor purchase are negative for all states, and significant at the 5% level for Arizona, California, Florida, Illinois and Nevada. Investor purchases had less impact on the returns to selling nearby houses outside their price range, than on the returns of houses with similar prices.

The results in Table 2 show clearly that prices of nearby houses rose after purchases by buy-to-rent investors. This implies that buy-to-rent institutional buyers did well on their investments. It also suggests that property owners' concerns about potential detrimental effects of renters moving into their neighborhood seem less important than the benefits of purchases by buy-to-rent investors.

Housing Markets after Buy-to-Rent Investors

After 2006, fewer houses were bought using mortgages. This was especially true for the areas where buy-to-rent investors chose to purchase houses. As we have seen, these areas experienced significant price appreciation after buy-to-rent purchases. In this section we see whether the increase in house prices was accompanied by an increase in mortgage use by homebuyers.

To test this, we estimate the regression of equation (1). This time, rather than using the return on the round trip transaction as the dependent variable, we use an indicator variable for the use of a mortgage to buy the house. That is,

$$D_{Mortgage} = \gamma_{Bundle,BuyYear} + \alpha_1 D_{<\frac{1}{4}Mile} + \alpha_2 D_{AfterInsBuy} + \alpha_3 D_{<\frac{1}{4}Mile} \times D_{AfterInsBuy} + \varepsilon_i \quad (2)$$

Each observation is sale of a property that is close to a buy-to-rent investor's bundle of purchases or distant from that bundle. Close is defined as within ¼ mile of the center of the bundle, while distant is 50 to 75 miles away. The transaction must occur within the quarter prior to the acquisition of property by the buy-to-rent investor, or in the four quarters afterwards. Fixed effects are included for each bundle. Standard errors are clustered on the property sales.

Results are shown in Table 5. Panel A provides regression results when transactions from all states are included. The first regression uses ¼ mile as the distance for a close property and uses transactions from one year before and one year after the buy-to-rent purchases. The intercept coefficient is 0.336, indicating that 33.6% of house purchases 50-75 miles away from the buy-to-rent bundle used mortgages before the

buy-to-rent purchase. The proportion of purchases within $\frac{1}{4}$ mile of the buy-to-rent bundle that occurred before the buy-to-rent purchase that used a mortgage was lower by 2.3%. Regression (1) indicates that after the buy-to-rent purchase, the proportion of purchases that used mortgages increased by 0.9% and an additional 3.9% for a total of 4.8% for nearby properties.

Mortgage use increased much more for properties that were close to the buy-to-rent bundle than for distant properties. Following buy-to-rent purchases, lenders become more willing to lend to buyers purchasing property near the buy-to-rent bundle. It is possible that lenders believe that buy-to-rent investors are eliminating an excess supply of houses in the area, and that a foreclosure would be easier to dispose of if the borrower defaulted. It is also possible that lenders believe the buy-to-rent investor would be willing to purchase the property if the borrower defaulted. Alternatively, the increase in mortgages could reflect a change in the house buyers. Individuals who invest in houses are less likely to use mortgages than homebuyers who intend to live in the properties. Perhaps, more of the houses are being bought by buyers who will live in them.

In regression (2) and the remaining regressions in Panel A, standard errors are clustered on the transactions. This reduces t-statistics, but the coefficient on the interaction between a property being located near the buy-to-rent bundle and the transaction occurring after the buy to rent purchase remains positive and highly significant in each regression. Mortgages are more likely to be used for houses near the buy-to-rent purchases after the purchase takes place.

In regression (4), close to the bundle is defined as being within $\frac{1}{10}$ of a mile rather than $\frac{1}{4}$ mile. This is roughly one city block. Now the coefficient on the dummy for being located close to the bundle is a statistically significant -0.036. Prior to the buy-to-rent purchase mortgages were less common for nearby properties. The coefficient on the interaction between close to the bundle and after the bundle purchase increases to 0.050 with a t-statistic of 5.1. Buy-to-rent purchases seem to have a particularly large effect on the likelihood of using a mortgage to purchase very close properties.

Panel B reports regression estimates for each individual state. Intercepts and other coefficients vary substantially across states, suggesting that a lot of information may be lost by putting all states into the same regression. In the individual state regressions, with the exception of North Carolina, the coefficient on the interaction between close to the buy-to-rent bundle and after the buy-to-rent purchase is positive. For California, Florida, and Illinois, the coefficient on the interaction is larger than in the regression with

all states, and significant at the 1% level. Mortgage use increased for properties near buy-to-rent purchases after the purchases occurred.

Is the increase in mortgage lending coming from existing lenders or from new entrants?

Mortgage lending increases after buy-to-rent purchases, but it is not clear whether the increase in mortgage lending occurs because new lenders step in to take the place of lenders that went out of business after the financial crisis, or because old lenders became more willing to loan to homebuyers.

We identify all lenders in each state that originated at least 50 mortgages in the 12 months before a buy-to-rent purchase. Using all bundles of buy-to-rent purchases, we count the total number of house sales that occurred within a $\frac{1}{4}$ mile of the buy-to-rent purchase in the prior year. For each individual lender, we count the number of mortgages underwritten by the lender for houses within $\frac{1}{4}$ mile of a buy-to-rent purchase j in the prior year, and standardize it by dividing by the total number of house purchases within a $\frac{1}{4}$ of a mile of a buy-to-rent purchase j , with or without mortgages, over the same period. We then subtract the ratio of the lender's number of mortgages 50-75 miles from a buy-to-rent purchase j to the total number of all house purchases 50-75 miles from a buy-to-rent purchase j . Summing across all bundles gives the before difference for lender i

BeforeDifference_i

$$= \sum_{j=1}^J \frac{\text{NumberMortgages by } i \text{ within } \frac{1}{4} \text{ mile of bundle } j \text{ before bundle purchase}}{\text{total number house purchases within } \frac{1}{4} \text{ mile of bundle } j \text{ before bundle purchases}} \\ - \frac{\text{NumberMortgages by } i \text{ 50 – 75 miles from bundle } j \text{ before bundle purchase}}{\text{total number house purchases 50 – 75 miles from bundle } j \text{ before bundle purchases}}$$

We calculate a similar after difference for lender i using mortgages and house sales in the year after buy-to-rent purchases

After Difference_i

$$= \sum_{j=1}^J \frac{\text{NumberMortgages by } i \text{ within } \frac{1}{4} \text{ mile of bundle } j \text{ after bundle purchase}}{\text{total number house purchases within } \frac{1}{4} \text{ mile of bundle } j \text{ after bundle purchases}}$$

$$= \frac{\text{Number Mortgages by } i \text{ 50 – 75 miles from bundle after bundle purchase}}{\text{total number house purchases 50 – 75 miles from bundle after bundle purchases}}$$

We then calculate a difference in differences for lender i

$$\text{Difference in Differences}_i = \text{After Difference}_i - \text{Before Difference}_i$$

We have already seen that after buy-to-rent purchases, the proportion of houses near buy-to-rent purchases that were bought with mortgages increased more than the proportion of houses far from buy-to-rent purchases that were bought with mortgages. By examining these difference in differences for each lender i , we intend to see if mortgage lenders who were active before buy-to-rent purchases increased their mortgage lending near the buy-to-rent purchase afterwards.

Results are shown in Table 6. The first row shows the median and mean before difference, after difference, and difference in differences for Arizona lenders. The median before difference of 0.00027 indicates that before the buy-to-rent purchase, most of the Arizona lenders provided mortgages for a higher proportion of house purchases near the buy-to-rent purchase than for house purchases 50-75 miles away. Both the median and mean after difference are positive, indicating that after the buy-to-rent purchase, Arizona lenders also provided mortgages for a larger percentage of house purchases near buy-to-rent purchases than far from the purchases. The mean and median of the difference in differences is shown in the next column. Both are 0.00116. Most lenders, and lenders on average, increased the proportion of house purchases that they helped finance with mortgages more for house purchases near buy-to-rent bundles than for house purchases farther away. The t-statistic of 2.6 indicates that the mean difference in differences is statistically significant.

The next four columns replicate the first four, but use periods of six months before and after the buy-to-rent purchases. Results are similar. Mean and median differences in differences are larger, indicating that most lenders increased their mortgage lending for purchases near buy-to-rent bundles more than for purchases 50-75 miles away. The succeeding rows show results for California, Florida, Illinois, Nevada, and North Carolina. Median differences in differences are always positive while mean differences are positive for every state except North Carolina. Mean differences in differences for one-year before and after periods are positive and statistically significant for Arizona, Florida, Illinois, and Nevada.²

² Georgia is omitted because lender identities are seldom included in the mortgage data.

As a whole, the results in Table 6 indicate that existing lenders increased mortgage lending around buy-to-rent bundles after the buy-to-rent purchases by more than they increased lending elsewhere. The increase in mortgage lending after buy-to-rent purchases did not come from entry into the market by new lenders.

Regressions with foreclosure dummies

We use price appreciation of nearby properties to estimate returns to buy-to-rent investors. Some of that price appreciation may not be due to a general increase in home values, but instead to the elimination of negative externalities from purchases of foreclosed houses by buy-to-rent investors. As a test of the importance of eliminating externalities, we regress returns on repeat sales of houses within ¼ mile of a buy-to-rent bundle purchase on a dummy variable that equals one if the house in the repeat sale is on the same street as a house in the buy-to-rent purchase bundle. That is, we estimate

$$\ln\left(\frac{P_2}{P_1}\right) = \gamma_{ZipCode,BuyYear} + D_{Foreclosure} + D_{AfterInst.Buy} + D_{Foreclosure} \cdot D_{AfterInst.Buy} + \varepsilon_i \quad (4)$$

where P_2 is the price of the house in the second transaction, P_1 is the house price in the first transaction, $\gamma_{ZipCode,BuyYear}$ is a fixed effect for the combination of the zip code and the purchase year for the first trade in the round trip. $D_{AfterInst.Buy}$ is a dummy variable that is one if the second transaction in the repeat sale took place in the four quarters following the institutional purchases in the bundle, and zero if the transaction took place in the quarter before the institutional purchases.

Results are shown in Table 7. The first regression includes properties in all states. The coefficient on the dummy variable for after the buy-to-rent purchase is 0.073. Recall that all of the repeat sales in this regression are of houses within ¼ mile of buy-to-rent purchases, and house prices around the buy-to-rent bundles increased about 7.3% in the year following the buy-to-rent purchase. Of more interest in the coefficient on the interaction between the buy-to-rent property being foreclosed and the dummy variable for after the buy-to-rent purchase. It is 0.024, with a t-statistic of 8.0. Houses that are close to buy-to-rent purchases earn returns of $e^{0.073} - 1 = 7.6\%$ over the next year. If the buy-to-rent investor buys a foreclosed property nearby house appreciate by $e^{0.073+0.024} - 1 = 10.2\%$. Returns are particularly high if the buy-to-rent investor buys a foreclosed property, but they are large and significant even if the property is not foreclosed. Eliminating the negative externalities of foreclosed properties is not the only reason nearby properties appreciate after buy-to-rent purchases.

The remaining columns of the table provide results for individual states. With the exception of Nevada, house price appreciation is larger after buy-to-rent purchases if the bundle contains a foreclosed property. It is also generally true though that the extra price appreciation around buy-to-rent bundles that contain a foreclosure is small relative to the appreciation that comes from being close to a bundle. This is especially true for the sand states of Arizona, California, Florida and Nevada which had experienced large price declines over 2006 – 2011. In California for example, the coefficient on the dummy variable for after a buy-to-rent purchase is 0.139, while the coefficient on the interaction between after the buy-to-rent purchase and foreclosure is 0.026. In the sand states, nearby properties appreciated significantly after buy-to-rent purchases, but they increased only slightly more if a foreclosed property was included in the bundle.

Conclusions

In the aftermath of the financial crisis, house prices were much lower than they had been a few years before. In some cities, houses sold for below replacement costs. Many potential homebuyers were shut out of the market as a result of foreclosures, losses on previously owned houses or tightened mortgage lending standards. Large numbers of foreclosed properties were available for purchase.

As prices continued to fall into 2011 and 2012, some value investors believed that single family homes presented an outstanding investment opportunity. In some areas, particularly those hit hard by the 2008-2009 crash in real estate prices, the low prices and large number of available houses provided an opportunity for investment firms to apply a new business model to the real estate market – large scale, buy-to-rent ownership of single family homes. Over the 2010 – 2015 period, a handful of large investment firms bought tens of thousands of single family houses and converted them to rental properties.

Their investments paid off. Properties that were close to buy-to-rent purchases appreciated much more than distant properties over the two years following their investments. The price appreciation of nearby properties occurred across states and across buy-to-rent investors. And, while the buy-to-rent investors have done well, nearby homeowners also seem to have been helped by their purchases. Nearby houses have appreciated and mortgages seem to be easier to get for properties near the buy-to-rent purchases.

Table 1.

Number of house purchases by buy-to-rent investors by state.

	All	Altisource	American Homes 4 Rent	American Residential Properties	Colony	Invitation Homes	Progress Residential	Silver Bay Realty Trust	Starwood Waypoint
Arizona	9,757	230	2,849	1,240	1,003	1,756	1,846	21	812
California	11,180	1,023	1,030	249	3,472	3,375	356	114	1,561
Florida	39,770	1,727	6,488	570	5,468	13,697	5,602	154	6,064
Georgia	18,227	645	1,829	8	4,029	5,441	2,821	75	3,379
Illinois	6,970	511	2,878	100	99	2,159	0	4	1,219
North Carolina	10,488	356	4,851	312	717	2,320	1,670	17	245
Nevada	4,666	30	827	20	1,689	636	1,178	7	279
All	101,058	4,522	20,752	2,499	16,477	29,384	13,473	392	13,559

Panel B. Percent of houses purchased 2010-2015 after foreclosure within previous three months, and at auction.

	Altisource	American Homes 4 Rent	American Residential Properties	Colony	Invitation Homes	Progress Residential	Silver Bay Realty Trust	Starwood Waypoint
Percent Foreclosed	17.3%	32.5%	9.4%	47.1%	24.0%	13.8%	1.7%	27.0%
Percent Auctioned	16.7%	30.5%	8.7%	45.5%	21.8%	11.6%	1.7%	25.7%
	All States	Arizona	California	Florida	Georgia	Illinois	Nevada	N. Carolina
Percent Foreclosed	28.4%	21.8%	35.0%	23.5%	47.4%	18.0%	29.1%	19.7%
Percent Auctioned	26.6%	19.5%	32.7%	20.9%	47.4%	17.3%	25.0%	18.5%
	2010	2011	2012	2013	2014	2015		
Percent Foreclosed	19.3%	24.1%	47.5%	30.4%	23.6%	15.8%		
Percent Auctioned	15.9%	21.4%	45.6%	28.2%	22.1%	14.7%		

Table 2.

Regressions of price changes for repeat sale on fixed effects for each bundle of houses purchased by buy-to-rent investors x purchase year for the repeat sale house, and a dummy variable that is one after the buy-to-rent purchase. Bundles of houses purchased by buy-to-rent investors are based on purchases within $\frac{1}{4}$ mile of the bundle center in the same quarter. Repeat sales within $\frac{1}{4}$ of the bundle center are defined as close to the center. Significance at the 1% level (two-tailed test) is indicated by ***, ** indicates significance at the 5% level, and * indicates significance at the 10% level.

Panel A. All States

	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	0.041*** (12.7)	0.034** (2.1)	0.014 (1.3)	0.040** (2.5)	0.010 (0.63)	0.019 (1.2)
Close to Bundle	-0.251*** (-27.6)	-0.233*** (-12.4)	-0.224*** (-17.4)	-0.245*** (-13.4)	-0.245*** (-12.2)	-0.249*** (-12.1)
After Inst. Buy	-0.007** (-2.1)	0.016 (0.9)	0.030* (1.9)	0.002 (0.1)	0.015 (0.9)	-0.000 (-0.00)
Close to Bundle x After Inst. Buy	0.105*** (13.4)	0.073*** (4.0)	0.096*** (6.0)	0.069*** (3.5)	0.087*** (4.5)	0.084*** (4.0)
Adj. R ²	0.099	0.184	0.186	0.158	0.175	0.160
Observations	1,030,838	1,008,425	2,416,995	720,945	773,541	571,659
Number FEs	248,829	246,399	356,842	196,666	132,867	113,008
Number Clusters	0	399,722	399,722	203,501	108,913	87,702
After Period	1 Year	1 Year	1 Year	6 Months	1 Year	6 Months
Before Period	1 Qtr	1 Qtr	1 Year	1 Qtr	1 Qtr	1 Qtr
Distance from Bundle	$\frac{1}{4}$ Mile	$\frac{1}{4}$ Mile	$\frac{1}{4}$ Mile	$\frac{1}{4}$ Mile	1/10 Mile	1/10 Mile
Delete Outliers	No	Yes	Yes	Yes	Yes	Yes
Cluster Other House	No	Yes	Yes	Yes	Yes	Yes

Panel B. Bundles of houses purchased by buy-to-rent investors are based on purchases within $\frac{1}{4}$ mile of the bundle center in the same quarter. Regressions of price changes for repeat sale on fixed effects for each bundle of houses purchased by buy-to-rent investors x purchase year for the repeat sale house, and a dummy variable that is one after the buy-to-rent purchase. Repeat sales within $\frac{1}{4}$ of the bundle center are defined as close to the center. The before and after periods are one year. Outlier returns (largest and smallest 1%) are deleted.

	Arizona	California	Florida	Georgia	Illinois	Nevada	NCarolina
Intercept	0.073** (2.5)	0.060*** (3.0)	0.188*** (2.9)	0.048 (0.7)	0.098 (1.3)	-0.029 (-1.3)	-0.049 (-1.4)
Close to Bundle	-0.333*** (-10.9)	-0.288*** (-6.5)	-0.402*** (-5.27)	0.310*** (3.0)	-0.297** (-2.5)	-0.279*** (-10.1)	0.123*** (2.8)
After Inst. Buy	0.084** (2.0)	-0.025 (-1.4)	-0.211*** (-5.4)	0.010 (0.1)	-0.061 (-1.4)	0.011 (0.6)	0.024 (0.4)
Close x After Buy	0.048 (1.2)	0.154*** (8.1)	0.288*** (7.3)	0.001 (0.0)	0.133*** (3.0)	0.110*** (5.6)	-0.001 (-0.00)
Adj. R ²	0.211	0.327	0.306	0.017	0.039	0.368	0.094
Observations	192,686	118,984	181,209	117,008	45,124	281,722	71,692
# Fixed Effects	32,342	33,268	86,920	17,542	19,428	33,903	22,991
# Clusters	21,097	55,538	112,262	9,908	23,505	17,400	21,872

Panel C. Distant properties are five to ten miles from bundles.

	All States	Arizona	California	Florida	Georgia	Illinois	Nevada	NCarolina
Intercept	-0.020*** (-4.8)	-0.111*** (-12.7)	0.155*** (23.8)	-0.125*** (-15.7)	0.095** (2.5)	-0.208*** (-11.9)	-0.377*** (-26.4)	0.197*** (12.9)
Close to Inst. Bundle	-0.106*** (-13.4)	-0.099*** (-6.4)	-0.127*** (-9.6)	-0.072*** (-4.6)	0.262*** (3.2)	-0.000 (-0.0)	-0.061** (-2.3)	-0.094*** (-3.8)
After Inst. Buy	0.047*** (10.5)	0.031*** (2.75)	0.079*** (13.5)	0.037*** (4.2)	0.055 (1.5)	0.007 (0.4)	-0.012 (-0.9)	0.003 (0.2)
Close to Bundle x After Inst. Buy	0.033*** (6.0)	0.069*** (5.4)	0.053*** (5.6)	0.040*** (4.0)	-0.085 (-1.4)	0.072*** (3.59)	0.114*** (7.6)	0.025 (1.3)
Adj. R ²	0.365	0.379	0.485	0.350	0.067	0.301	0.484	0.203
Observations	1,242,672	119,164	346,898	496,857	50,203	71,350	63,478	94,722
Number FEs	285,047	27,603	73,740	128,039	13,463	25,561	13,540	32,425
Number Clusters	435,662	38,777	90,801	189,227	16,376	35,176	27,966	37,340

Panel D. House appreciation after buy-to-rent purchases by each investor. Distant properties are five to ten miles from bundles.

	Altisource Res.	American Homes 4 Rent	American Res. Properties	Colony Homes	Invitation Homes	Progress Res.	Silver Bay Realty Trust	Starwood Waypoint
Intercept	0.281*** (43.6)	-0.115*** (-17.3)	-0.173*** (-7.6)	0.099*** (16.0)	0.095*** (6.8)	-0.025 (-1.5)	-0.151 (-1.6)	0.050*** (3.9)
Close to Inst. Bundle	-0.101*** (-4.8)	-0.074*** (-5.6)	-0.017 (-0.4)	-0.126*** (-8.3)	-0.064*** (-3.3)	-0.062** (-2.4)	0.141 (0.8)	-0.048* (-1.9)
After Inst. Buy	0.049*** (6.00)	0.022** (2.2)	-0.079*** (-2.9)	0.096*** (12.9)	0.049*** (4.0)	0.012 (0.8)	-0.029 (-0.2)	0.072*** (5.2)
Close to Bundle x After Inst. Buy	0.031 (1.5)	0.041*** (3.5)	0.119*** (3.4)	0.035*** (3.2)	0.032** (2.1)	0.076*** (4.1)	-0.053 (-0.3)	0.023 (1.2)
Adj. R ²	0.295	0.398	0.371	0.495	0.409	0.395	0.354	0.365
Observations	67,754	207,059	25,641	188,960	183,604	63,854	2,098	84,434
Number FEs	12,343	51,886	3,531	46,399	56,447	20,311	702	23,414
Number Clusters	36,584	87,772	12,659	73,174	75,992	34,483	1,218	43,721

Panel E. Long-term returns

	All	Arizona	California	Florida	Georgia	Illinois	Nevada	NCarolina
Intercept	0.035** (2.0)	0.074*** (2.6)	0.086*** (3.8)	0.230*** (3.8)	0.027 (0.4)	0.111 (1.4)	-0.019 (-0.8)	-0.036 (-1.1)
Close to Bundle	-0.231*** (-12.0)	-0.325*** (-10.9)	-0.278*** (-6.3)	-0.430*** (-6.4)	0.364*** (3.4)	-0.302*** (-2.6)	-0.293*** (-10.3)	0.080* (1.9)
After Institutional Buy	0.018 (1.1)	0.084** (2.2)	-0.023 (-1.3)	-0.213*** (-5.8)	0.018 (0.3)	-0.070* (-1.7)	0.013 (0.7)	0.025 (0.5)
2 nd Year After Institutional Buy	0.024 (1.2)	0.124** (2.6)	0.052 (1.50)	0.015 (0.2)	-0.015 (-0.1)	-0.018 (-0.4)	0.017 (0.8)	-0.102* (-1.7)
Close x After Buy	0.073*** (4.4)	0.049 (1.2)	0.161*** (8.6)	0.290*** (7.9)	-0.021 (-0.3)	0.137*** (3.3)	0.112*** (6.1)	0.002 (0.0)
Close x 2 nd Year After Institutional Buy	0.057*** (2.8)	-0.033 (-0.7)	0.058 (1.6)	0.062 (0.8)	-0.013 (-0.1)	0.073 (1.5)	0.105*** (5.1)	0.128** (2.2)
Adj. R ²	0.204	0.202	0.339	0.353	0.030	0.080	0.315	0.114
Observations	1,397,480	224,363	142,762	260,194	139,399	63,927	480,911	85,924
Number Fixed Effects	302,380	36,418	43,103	111,847	20,430	25,707	37,812	27,057
Number Clusters	326,344	28,202	67,910	140,108	11,691	30,829	22,362	25,242

Table 3. The distribution of property prices

Panel A. The distribution of prices paid by buy-to-rent investors over 2010-2015, by state.

	5%	25%	Median	75%	95%
All	\$65,000	\$110,000	\$144,184	\$187,000	\$305,000
Arizona	\$77,000	\$113,855	\$140,000	\$173,000	\$256,000
California	\$117,410	\$173,000	\$231,000	\$300,000	\$445,000
Florida	\$62,500	\$110,600	\$146,000	\$198,000	\$307,000
Georgia	\$50,500	\$87,800	\$123,000	\$154,000	\$208,000
Illinois	\$72,660	\$117,000	\$152,000	\$190,000	\$295,000
Nevada	\$93,000	\$129,900	\$159,000	\$195,000	\$285,000
North Carolina	\$74,123	\$120,000	\$149,500	\$178,000	\$242,000

Panel B. The distribution of prices in all transactions over 2010-2015.

	5%	25%	Median	75%	95%
All	\$15,000	\$75,000	\$158,000	\$285,000	\$725,000
Arizona	\$21,100	\$81,000	\$150,500	\$248,431	\$505,000
California	\$45,001	\$165,000	\$290,000	\$485,000	\$1,185,000
Florida	\$8,500	\$54,000	\$119,000	\$218,600	\$550,000
Georgia	\$10,000	\$42,501	\$105,140	\$194,000	\$460,000
Illinois	\$16,500	\$71,000	\$147,175	\$258,000	\$605,000
Nevada	\$21,500	\$96,554	\$170,000	\$263,474	\$501,220
North Carolina	\$13,500	\$68,000	\$143,000	\$237,000	\$510,000

Table 4.

Regressions of log price changes in repeat sales on dummy variables for house prices less than the 5th percentile of prices paid by buy-to-rent investors in that state, more than the 95th percentile of prices paid by buy-to-rent investors in that state, a dummy variable that is one after the buy-to-rent purchase, and interactions between the dummy variable for after buy-to-rent purchases and the cheap and expensive houses. All houses within ½ mile of a bundle of buy-to-rent purchases are included. Outliers, defined as returns below the first percentile or above the 99th percentile of repeat sale price changes are omitted. Fixed effects are used for each combination of buy-to-rent purchase and year of the first sale in the repeat sale. Significance at the 1% level (two-tailed test) is indicated by ***, ** indicates significance at the 5% level, and * indicates significance at the 10% level.

	All	Arizona	California	Florida	Georgia	Illinois	Nevada	N Carolina
Intercept	-0.226*** (-188.1)	-0.223*** (-82.2)	-0.070*** (-28.4)	-0.284*** (-133.0)	0.160*** (11.3)	-0.224*** (-72.7)	-0.457*** (-98.1)	-0.050*** (-10.5)
Price < 5 th Percentile	0.575*** (109.1)	0.225*** (14.9)	0.343*** (28.6)	0.695*** (73.9)	1.064*** (29.2)	0.364*** (13.9)	0.065** (2.5)	1.013*** (32.8)
Price > 95 th Percentile	-0.040*** (-12.2)	-0.050*** (-5.7)	-0.085*** (-10.8)	-0.063*** (-8.6)	-0.462*** (-13.5)	0.044*** (4.7)	0.003 (0.3)	-0.160*** (-10.8)
After Institutional Buy	0.114*** (85.6)	0.161*** (54.9)	0.168*** (55.9)	0.107*** (43.4)	0.075*** (3.8)	0.092*** (24.6)	0.157*** (32.6)	0.053*** (11.7)
Price < 5% x After	-0.038*** (-7.2)	-0.020 (-1.5)	-0.006 (-0.5)	-0.021** (-2.4)	0.075* (1.9)	-0.052* (-1.9)	-0.092*** (-3.7)	-0.079*** (-3.1)
Price > 95% x After	-0.017*** (-5.5)	-0.016** (-2.2)	-0.021*** (-3.0)	-0.014** (-2.2)	-0.052 (-1.61)	-0.023*** (-2.8)	-0.045*** (-5.7)	-0.005 (-0.4)
Observations	2,111,673	160,834	246,234	1,093,067	60,489	174,374	194,811	181,921
Fixed Effects	355,194	48,207	98,257	282,877	24,892	59,565	35,938	63,620
Clusters	619,897	52,371	108,123	293,948	17,337	61,163	40,451	45,353
Adj. R ²	0.456	0.640	0.667	0.461	0.408	0.559	0.457	0.567

Table 5.

Purchases by buy-to-rent investors and mortgage use. In each regression, the dependent variable is a dummy variable that is one if a mortgage is used in the second sale of a repeat sale. The first explanatory variable is a dummy that equals one if the house in the repeat sale is within $\frac{1}{4}$ (1/10) mile of the buy-to-rent investment. Other houses are between 50 and 75 miles away. The second equals one if the second sale in the repeat sale takes place after the buy-to-rent investor purchased. The third explanatory variable is the interaction of the other two and takes a value of one if the property in the repeat sale is located close to the buy-to-rent bundle and the second sale occurred after the buy-to-rent purchase occurred. Fixed effects are assigned for each buy-to-rent purchase bundle. A repeat sale is before the buy-to-rent purchase if it occurred in the year (or six months) before the bundle purchase and after if it occurred in the year (or six months) afterwards. Significance at the 1% level (two-tailed test) is indicated by ***, ** indicates significance at the 5% level, and * indicates significance at the 10% level.

Panel A. All states.

	(1)	(2)	(3)	(4)	(5)
Intercept	0.336*** (293.6)	0.336*** (39.5)	0.340*** (40.9)	0.318*** (39.2)	0.326*** (41.7)
Close to Bundle	-0.023*** (-8.2)	-0.023* (-1.8)	-0.024* (-1.9)	-0.036** (-2.5)	-0.036** (-2.5)
After Inst. Buy	0.009*** (6.8)	0.009 (1.1)	0.011 (1.3)	0.008 (1.0)	0.010 (1.2)
Close to Bundle x After Inst. Buy	0.039*** (15.9)	0.039*** (4.5)	0.022** (2.56)	0.050*** (5.1)	0.030*** (3.0)
Adj. R ²	0.109	0.109	0.108	0.104	0.105
Observations	1,055,694	1,055,984	748,819	816,760	596,903
Number Fixed Effects	60,495	43,633	41,622	32,744	28,152
Number Clusters	0	267,170	207,963	111,685	90,083
After Period	1 Year	1 Year	6 Months	1 Year	6 Months
Distance from Bundle	0.25 Miles	0.25 Miles	0.25 Miles	0.10 Miles	0.10 Miles
Cluster Other House	No	Yes	Yes	Yes	Yes

Panel B. Results for individual states. In each regression, a property is close to the bundle if it is within $\frac{1}{4}$ mile. The before and after periods are always one year

	Arizona	California	Florida	Georgia	Illinois	Nevada	NCarolina
Intercept	0.354*** (20.4)	0.432*** (42.9)	0.436*** (11.8)	0.058*** (8.3)	0.560*** (12.4)	0.328*** (17.8)	0.479*** (18.7)
Close to Bundle	-0.034 (-1.3)	-0.020 (-0.6)	-0.108** (-2.5)	-0.038*** (-6.4)	-0.149* (-1.9)	-0.017 (-0.8)	0.012 (0.4)
After Inst. Buy	0.055** (2.2)	-0.011 (-0.8)	-0.023 (-1.4)	-0.033*** (-6.0)	-0.048*** (-2.8)	0.011 (0.8)	0.008 (0.2)
Close x After Inst.	0.051** (2.0)	0.091*** (6.0)	0.062*** (3.7)	0.033*** (5.6)	0.105*** (5.6)	0.039*** (2.6)	-0.002 (-0.00)
Adj. R ²	0.024	0.049	0.089	0.193	0.063	0.002	0.059
Obs.	200,713	122,258	185,210	135,498	50,609	288,407	72,999
# FEs	3,659	6,358	17,154	6,155	3,643	1,957	4,701
# Clusters	21,302	56,480	114,791	10,145	24,360	17,752	22,340

Table 6.

The distribution, across mortgage lenders with at least 50 mortgage loans before buy-to-rent purchases, of differences in the proportion of house sales with mortgages for houses within a 1/4 mile of a buy-to-rent purchase and houses 50-75 miles from a buy-to-rent purchase. Significance at the 1% level (two-tailed test) is indicated by ***, ** indicates significance at the 5% level, and * indicates significance at the 10% level.

	One Year Before and After				Six Months Before and After			
	Diff. Before	Diff. After	Diff. in Diff.	Number Lenders	Diff. Before	Diff. After	Diff. in Diff.	Number Lenders
Arizona								
Med.	0.00027	0.00116	0.00116	66	0.00058	0.00146	0.00069	68
Mean	-0.00056	0.00060	0.00116*** (2.6)		-0.00044	0.00039	0.00083* (1.8)	
California								
Med.	0.00081	0.00096	0.00017	123	0.00101	0.00088	0.00025	114
Mean	0.00095	0.00110	0.00015 (0.8)		0.00077	0.00088	0.00011 (0.8)	
Florida								
Med.	0.00064	0.00070	0.00009	156	0.00064	0.00066	0.00009	154
Mean	0.00062	0.00108	0.00047** (2.2)		0.00060	0.00101	0.00041*** (2.7)	
Illinois								
Med.	0.00087	0.00108	0.00087	80	0.00223	0.00182	0.00074	76
Mean	0.00023	0.00199	0.00175*** (4.3)		0.00065	0.00205	0.00140*** (4.2)	
Nevada								
Med.	0.00226	0.00234	0.00067	45	0.00208	0.00204	0.00020	47
Mean	0.00150	0.00227	0.00077** (2.2)		0.00159	0.00193	0.00034* (1.8)	
North Carolina								
Med.	0.00064	0.00089	0.000016	102	0.00115	0.00126	0.00024	93
Mean	-0.00058	-0.00068	-0.00010 (-0.3)		-0.00080	-0.00090	-0.00010 (-0.3)	

Table 7.

Regressions of repeat sale price changes for properties located near buy-to-rent purchases on dummies variables for whether the buy-to-rent purchases was a foreclosed property, whether the repeat sale occurred after the buy-to-rent purchase and the interaction of the two. There are fixed effects for the zip code x the purchase year for the repeat sale house. The second sale in each repeat sale must occur within the quarter before the buy-to-rent purchases, or the four quarters afterwards. Standard errors are clustered on the repeat sale property. Significance at the 1% level (two-tailed test) is indicated by ***, ** indicates significance at the 5% level, and * indicates significance at the 10% level.

	All	Arizona	California	Florida	Georgia	Illinois	Nevada	N Carolina
Intercept	-0.139*** (-96.9)	-0.203*** (-65.8)	0.005* (1.8)	-0.179*** (-79.9)	0.453*** (30.7)	-0.195*** (-55.2)	-0.409*** (-97.8)	0.051*** (12.4)
Foreclosure	-0.041*** (-19.6)	-0.084*** (-18.3)	-0.077*** (-18.4)	-0.019*** (-5.5)	-0.053*** (-2.8)	-0.019*** (-3.3)	-0.039*** (-7.9)	-0.034*** (-5.5)
After Institutional Buy	0.073*** (41.2)	0.129*** (32.6)	0.139*** (33.7)	0.066*** (24.7)	-0.012 (-0.6)	0.068*** (15.3)	0.127*** (24.9)	0.010** (2.3)
Foreclosure x After	0.024*** (8.0)	0.024*** (3.7)	0.026*** (4.2)	0.009* (1.9)	0.075*** (2.9)	0.013 (1.6)	-0.002 (-0.3)	0.012 (1.4)
Observations	714,526	55,756	79,670	363,589	20,646	57,469	62,725	74,671
Fixed Effects	31,818	2,705	9,697	10,302	793	4,996	1,082	2,305
Clusters	343,177	30,629	52,171	164,177	10,065	31,042	26,587	28,506
Adj. R ²	0.438	0.558	0.6118	0.393	0.163	0.526	0.477	0.394

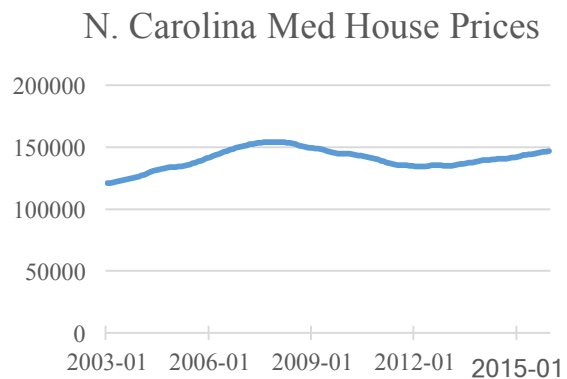
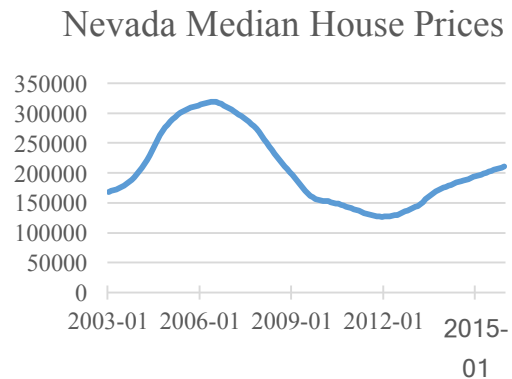
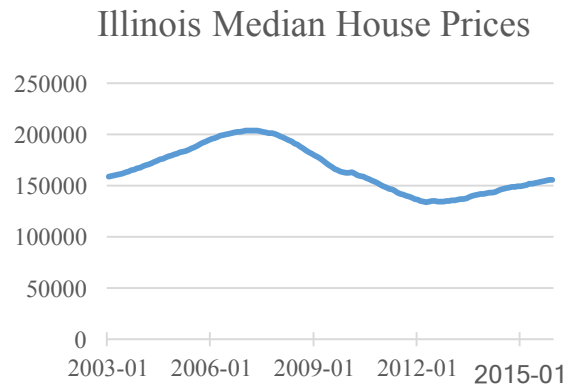
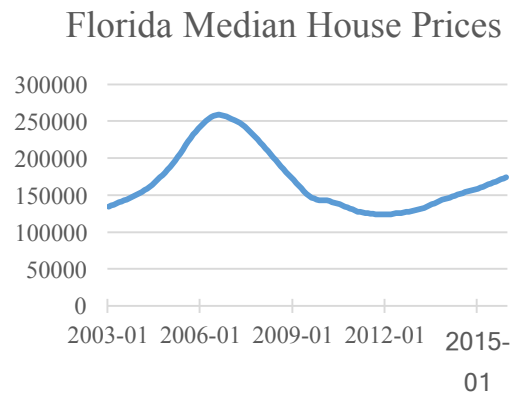
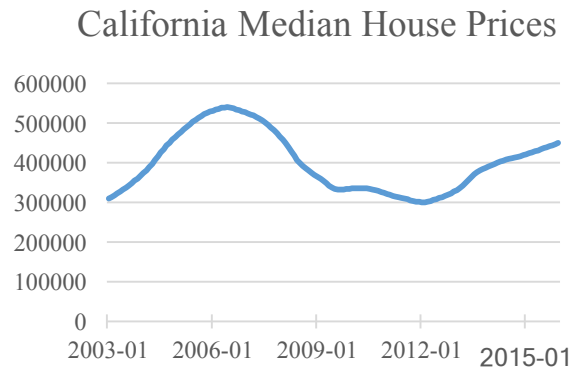
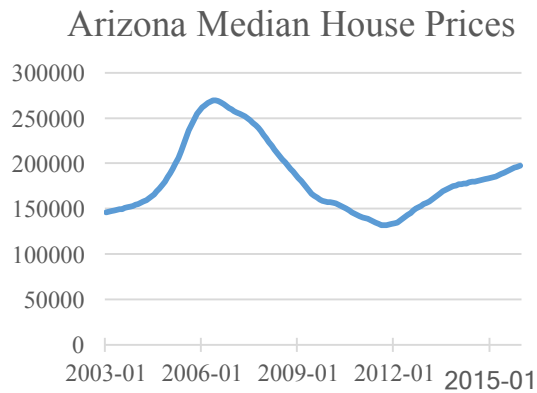


Figure 1. Monthly Median House Prices by State

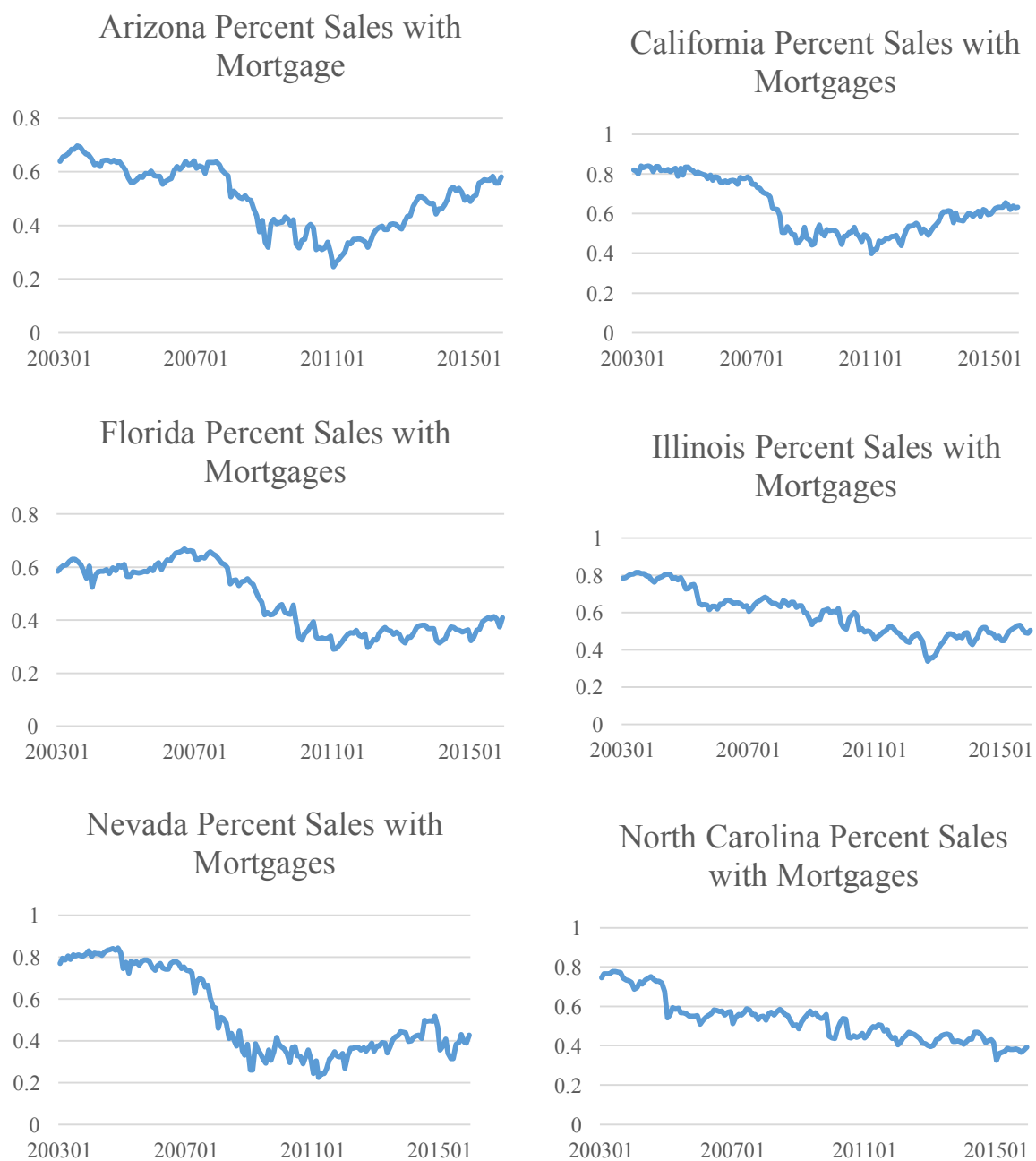


Figure 2. The proportion of homes purchased with a mortgage by month, 2003-2015.

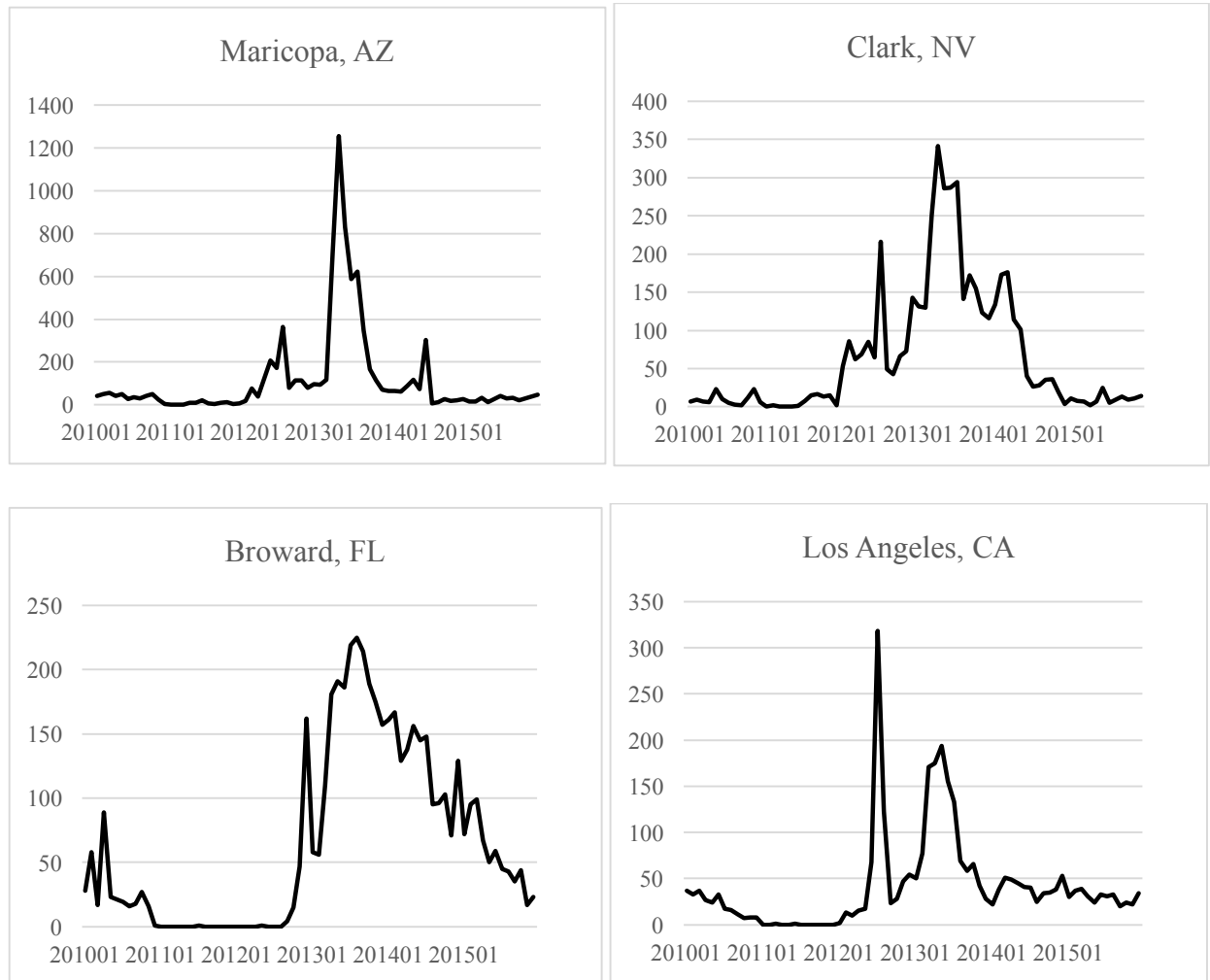


Figure 3. Number of house purchases by month by large buy-to-rent investors.

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